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Lu–Hf garnet and apatite geochronology date Svecofennian polymetamorphism in the Peräpohja, Kuusamo and Tuntsa schist belts, northern Finland

NAOMI M TUCKER[1,2], KATHRYN A CUTTS[1], STIJN GLORIE[3], SARAH E GILBERT[4], ESTER M JOLIS[1], ANDREW MENZIES[5] AND STEPAN M CHERNONOZHKIN[1]

[1]Geological Survey of Finland (GTK)
[2]University of Western Australia
[3]Adelaide University
[4]Adelaide Microscopy
[5]Bruker Nano GmbH

The Kuusamo, Peräpohja and Tuntsa schist belts are volcano–sedimentary basins of the northern Fennoscandian Shield that formed in an extensional setting and were subsequently deformed and metamorphosed under greenschist–amphibolite facies conditions during the long-lived Svecofennian Orogeny (ca. 1920–1770 Ma). We present the first in situ Lu–Hf garnet and apatite geochronology from these three regions and integrate these results with existing U–Pb garnet, monazite, and apatite data from the same samples. Garnet–mica ± staurolite schists and garnet-amphibolites in Kuusamo record regionally pervasive metamorphism at ca. 1795 Ma, with only limited preservation of earlier ca. 1890 Ma garnet growth identified in previous U–Pb studies [1]. In contrast, garnet–mica ± staurolite ± kyanite ± cordierite schists from Peräpohja record a more variable and complex polymetamorphic history, with Lu–Hf garnet dates of 1903 ± 20 Ma, ca. 1870–1830 Ma, and 1788 ± 29 Ma, and a Lu–Hf apatite date of 1760 ± 20 Ma. These results indicate early garnet growth, a younger overprint, and continued episodic or partially reset garnet growth in the intervening period. Two equivalent Lu–Hf garnet dates (1850 Ma) from metasedimentary and mafic schists in the Tuntsa Suite, together with existing monazite U–Pb ages (ca. 1795 Ma [2]), suggest a similarly protracted metamorphic evolution. Collectively, the Lu–Hf dataset refines earlier interpretations on the timing of Svecofennian orogenesis, distinguishing an early (ca. 1900 Ma) and late (ca. 1790–1760 Ma) tectonothermal pulse. The younger event is linked in part to large-scale fluid infiltration that mobilized and upgraded mineralization in the Peräpohja and Kuusamo belts.

References

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